



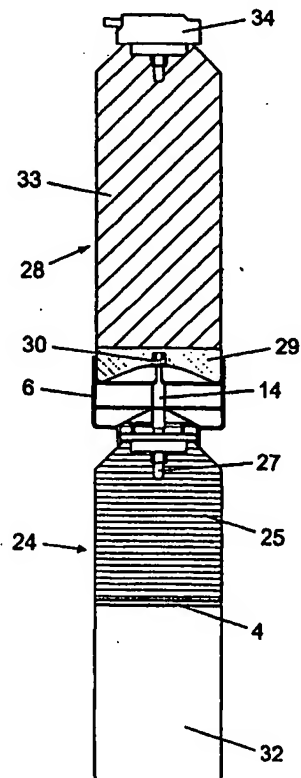
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: <b>PCT/GB99/03516</b></p> <p>(22) International Filing Date: <b>22 October 1999 (22.10.99)</b></p> <p>(30) Priority Data: <b>9823029.5</b>      <b>22 October 1998 (22.10.98)</b>      <b>GB</b></p> <p>(63) Related by Continuation (CON) or Continuation-in-Part (CIP) to Earlier Application <b>US</b>      <b>08/836,246 (CIP)</b> <b>Filed on</b>      <b>7 May 1997 (07.05.97)</b></p> <p>(71) Applicant (for all designated States except US): <b>GILTECH LIMITED [GB/GB]; 12 North Harbour Estate, Ayr KA8 8AA (GB).</b></p> <p>(72) Inventors; and (75) Inventors/Applicants (for US only): <b>COOPER, Matthew, Martin, Derome [GB/GB]; 8 Gilchrist Place, Mossblown KA6 5DW (GB). HEALY, David, Michael [IE/GB]; Midton House, By Alloway, Ayr KA7 4EG (GB).</b></p> <p>(74) Agent: <b>MURGITROYD &amp; COMPANY; 373 Scotland Street, Glasgow G5 8QA (GB).</b></p>	<p>(81) Designated States: <b>AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).</b></p> <p><b>Published</b> <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p>	

(54) Title: **PACKAGING SYSTEM FOR MIXING AND DISPENSING MULTICOMPONENT PRODUCTS**

## (57) Abstract

A packaging system which comprises a first container (24) having a valve (27) controlling the opening of an outlet and which contains a first ingredient (25), and a second container (28) having an openable entry portion (14) and containing a second ingredient (29). The packaging system further comprises means for connecting the first and second containers together in order to allow said first ingredient to be displaced from the first container into the second container via the entry portion thereof, so that said first and second ingredients are admixed in said second container to form a final product.



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1    PACKAGING SYSTEM FOR MIXING AND DISPENSING MULTICOMPONENT PRODUCTS

2

3    The present invention relates to a packaging system for  
4    combining and dispensing a product at its point of use.  
5    The packaging system herein described is particularly  
6    useful for combining and dispensing a mixture of  
7    products.

8

9    The packaging of products is a significant  
10   consideration for manufacturers and consumers. The  
11   factors requiring consideration in selecting a  
12   particular form of packaging include the suitability of  
13   the packaging for containing the product throughout its  
14   shelf life and the ease with which the product can be  
15   dispensed.

16

17   Many household products are packaged in pressurised  
18   aerosol containers. There are three main types of  
19   aerosol containers: standard, piston and bag-in-can.  
20   Standard aerosol containers are formed from aluminium  
21   or tin plate and contain a mixture of product and  
22   pressurised propellant. A piston can is an aluminium  
23   can having the product separated from the pressurised  
24   propellant by a piston which is normally polypropylene.  
25   A bag-in-can container is formed from aluminium or tin

1 plate with the product held within a bag attached to  
2 the can or valve, the propellant being held in the  
3 space between the container and bag. Bi-cans, which  
4 are a kind of bag-in-can type container also enable an  
5 active ingredient to be kept separate from a propellant  
6 gas. Bi-cans are usually formed from tin plate and  
7 comprise two compartments separated by a piston within  
8 the same can. The base of the can possesses a hole for  
9 a Nicholson valve. This valve allows the bottom  
10 compartment to be filled with a propellant gas. The  
11 choice of aerosol container type for any particular  
12 product is dependant upon the nature of the product and  
13 also the propellent used. Other factors that affect  
14 the choice of container include sterilisation (if  
15 necessary), cost, and the acceptable amount of product  
16 wastage (ie the amount of product which remains in the  
17 container after full deployment).

18  
19 Other parts of the complete aerosol device, such as the  
20 valve used and the actuator, are also selected upon  
21 their suitability having regard to the nature of the  
22 product and the type of aerosol container. The method  
23 of filling the container will also be affected  
24 similarly.

25  
26 Up to now aerosol devices could only be used with  
27 products that are stable within the container and  
28 therefore have a suitable shelf-life. However, there  
29 are many materials which must be produced from two or  
30 more ingredients mixed just prior to use. Examples of  
31 such products include: glue and hardener, glass fibre  
32 resin and catalyst, epoxy paints, hair colorants and  
33 cement/concrete.

34  
35 The present invention provides a packaging system

1 having a first container containing a first ingredient  
2 and a second container containing a second ingredient,  
3 the first and second containers being adapted for  
4 connection together such that upon deployment of the  
5 packaging system the first ingredient is displaced from  
6 said first container into said second container and an  
7 admixture of said first and second ingredients is  
8 subsequently dispensed from the packaging system.

9  
10 More particularly, the packaging system according to  
11 the invention comprises:

- 12 a) a first container having a valve controlling the  
13 opening of an outlet and containing a first  
14 ingredient;
- 15 b) a second container having a openable entry  
16 portion, containing a second ingredient; and
- 17 c) means for connecting the first and second  
18 containers together in order to allow the first  
19 ingredient to be displaced from the first  
20 container into the second container via the entry  
21 portion thereof, so that the first and second  
22 ingredients are admixed in the second container to  
23 form a final product.

24  
25 Conveniently the passage of the first ingredient from  
26 the first container through to the second container  
27 causes the first ingredient to be intimately blended  
28 with the second ingredient.

29  
30 It is preferred that the connecting means comprises a  
31 conduit to transfer said first ingredient into said  
32 second ingredient.

33  
34 Preferably the containers are each pressurised aerosol  
35 containers and the initial pressure in the second

1 container may be less than that in the first conduit.

2

3 In one embodiment the first container is a piston-style  
4 aerosol container. The first ingredient is placed into  
5 the first container which is then fitted with a top  
6 valve. The first container may then be sterilised, for  
7 example by autoclave. The container is then  
8 pressurised by inserting a propellant below the piston  
9 via an aperture in the bottom of the can. A preferred  
10 propellant is nitrogen gas, but a wide variety of  
11 propellants can be used since there is no contact  
12 between the propellant and the first ingredient (these  
13 being separated by the piston). The pressurized  
14 container is then sealed with a rubber bung or other  
15 suitable means. Alternatively the first container may  
16 be a bag-in-can style aerosol container, the first  
17 ingredient being separated from the propellant by the  
18 bag.

19

20 In one embodiment the second container may be an  
21 aerosol container of known type, advantageously adapted  
22 by having as an openable entry portion a Nicholson  
23 valve or bung or other seal preferably located in the  
24 bottom thereof. An example of another seal or entry  
25 portion would be a thin portion or membrane which could  
26 be pierced open. Thus, the second container is filled  
27 with an appropriate quantity of second ingredient via  
28 the top of the can which is then closed using a  
29 standard valve. The container may be pressurized by  
30 inserting a suitable propellant (desirably an inert  
31 propellant that does not react with the first and  
32 second ingredients). Alternatively, the second  
33 container may become sufficiently pressurised by the  
34 transfer of the first ingredient.

35

1     Optionally the connecting means are also provided with  
2     means to hold the first and second containers in  
3     suitable juxtaposition.  
4

5     The conduit may be a tube, preferably composed of  
6     plastics material.  
7

8     In a preferred embodiment the first container is  
9     positioned beneath the second container and connected  
10    thereto via the connecting means. It is also preferred  
11    that the first container be a standard directionally  
12    biased pressure activated valve as commonly provided on  
13    an aerosol can.  
14

15    Optionally the conduit cooperates with the openable  
16    entry portion of the second container so that when the  
17    entry is opened, the conduit permits entry of the first  
18    ingredient into the second container to take place.  
19

20    Optionally the conduit is shaped to co-operate with the  
21    valve of the first container and preferably to open it.  
22    For example the conduit may comprise a bayonet-shaped  
23    end.  
24

25    Preferably the second container has a bottom-mounted  
26    Nicholson valve or a bung which is removed or displaced  
27    into the second container by the connecting means to  
28    allow the entry of the first ingredient into the second  
29    container. Thus, in one embodiment the conduit may  
30    cooperate with the Nicholson valve located in the  
31    bottom surface of the second container and will  
32    displace the valve inwardly upon connection.  
33

34    In one preferred embodiment the connecting means is  
35    shaped and sized to facilitate the admixture of the

1 first and second ingredients within the second  
2 container. To aid suitable dispensation of the first  
3 ingredient, the conduit may terminate in a blind ending  
4 and possess multiple openings (usually 2, 3 or 4) in  
5 the side of the conduit, generally adjacent the blind  
6 end thereof. In one example the conduit openings may  
7 be shaped and dimensioned to dispense the first  
8 ingredient in a spiral flow so as to promote good  
9 admixture of the first and second ingredients.

10

11 In one embodiment the connecting means comprises a  
12 first sleeve projecting downwardly which engages the  
13 top of the first container and a second sleeve  
14 projecting upwardly which engages the bottom of the  
15 second container. Thus, the first container is  
16 positioned correctly with respect to the second  
17 container via the connecting means. This sleeve, may  
18 be composed of plastics material. The conduit is  
19 carried within the aperture of the sleeve. Desirably  
20 the sleeve forms a close-fit with the first and second  
21 containers. For example, the internal surface of the  
22 sleeve may comprise a series of ridges extending  
23 circumferentially. In use the first container may be  
24 pushed past one or more of these ridges to be locked  
25 into place and cause transfer of the first ingredient  
26 to the second container via the conduit.

27

28 Advantageously, means to actuate the displacement of  
29 the first ingredient to the second containers includes  
30 means to hold the first and second containers in  
31 suitable juxtaposition.

32

33 The sleeve may be used to retain the first container  
34 beneath the second container during both storage and  
35 distribution. The sleeve will also be responsible for



1 holding the containers together such that the contents  
2 of the first container may be transferred into the  
3 second container.

4  
5 Optionally the sleeve may include or be attached to an  
6 anti-tamper device.

7  
8 The connecting means may be moulded from plastics  
9 material as a one piece unit. Alternatively, and  
10 desirably, the sleeve may be formed from a first and  
11 second part which are rotatable relative to each other.  
12 The first part comprises both the conduit and the first  
13 and second sleeves. The second part comprises a third  
14 sleeve which is secured to or part of the bottom of the  
15 second container. The second and third sleeves have  
16 corresponding screw threads, which allow these second  
17 and third sleeves to be moved from a first position  
18 where the conduit is not actuating the openable entry  
19 portion to a second position where said conduit  
20 actuates said openable entry when transfer of the first  
21 ingredient is required.

22  
23 Thus, the sleeve parts may simply be screwed together  
24 to initiate transfer of the first ingredient.  
25 Desirably there may be a ratchet mechanism to prevent  
26 reversal of the rotation of the sleeve parts. In one  
27 embodiment the relative rotation of the sleeve parts is  
28 through approximately 120°.

29  
30 Preferably each of the containers may be sterilised,  
31 for example by autoclave techniques or by irradiation.

32  
33 Conveniently the second container may be filled with  
34 the second ingredient via an aperture in the bottom of  
35 the container which is then sealed, for example with a

1 rubber bung or Nicholson valve. This seal or valve may  
2 then be pushed into the container by the connecting  
3 means upon activation.

4

5 Preferably also the second container has a top mounted  
6 actuator which controls the dispensation of its contents.

7

8 Optionally each of the containers may also be adapted  
9 to dispense the ingredients contained therein in a  
10 conventional manner.

11

12 In a preferred embodiment the first ingredient is a  
13 gel, preferably a foamable gel, and the second  
14 ingredient is a powder.

15

16 In a preferred embodiment of the invention the  
17 packaging system of the present invention is designed  
18 to discharge the material described in WO-A-96/17595 of  
19 Giltech Limited wherein the powder constituent of said  
20 formulation is the second ingredient and is contained  
21 within the second container and the gel constituent of  
22 said formulation is the first ingredient and is  
23 contained within the first container.

24

25 In a preferred embodiment of the invention the  
26 connecting means is used to connect two aerosol  
27 canisters, which together contain the ingredients  
28 required to make a silver ion releasing water-soluble  
29 glass held in an alginate foam as described in WO-A-  
30 96/17595 of Giltech Limited.

31

32 In this embodiment the first container is a piston type  
33 aerosol canister, which contains a foamable gel (eg  
34 alginate) which is pressurised to approximately 130  
35 psi, for example with nitrogen gas. The second

1 container contains the powder ingredients of said foam  
2 (eg a water-soluble glass powder) and is pressurised to  
3 approximately 50 psi, for example with a liquified  
4 petroleum gas (eg CFC, HC, HFC propellants). However,  
5 the first container may also be a bag-in-can aerosol  
6 container where the first ingredient is separated from  
7 the propellant by a bag.

8  
9 The whole apparatus may be shaken after transfer of a  
10 the first ingredient to ensure proper mixing of the  
11 first and second ingredients before the foam can be  
12 discharged. Once discharge is complete the apparatus  
13 may be discarded.

14  
15 The packaging system described herein is based upon  
16 pressure differentials. When the containers are  
17 connected, if the pressure in the second container is  
18 less than that in the first container, upon connection  
19 the contents of the first container will flow into the  
20 second container as required. At equilibrium if the  
21 pressure in the second container is equal to the  
22 pressure in the first container no further transfer of  
23 material will take place. If the pressure in the  
24 second container is greater than the pressure in the  
25 first container the contents of the second container  
26 could flow back into the first container. This flow  
27 can however be prevented by the use of a one way valve  
28 at the top of the first container.

29  
30 The propellant selected for the second container is  
31 usually an excipient of the final product, which is  
32 produced by mixing the contents of the first container  
33 with the second container. The excipient is a  
34 substance conveniently used as a medium or a vehicle  
35 for administering the final product. It is

1 advantageously a gas which does not react with the  
2 first and second ingredients. However, if a barrier  
3 type canister is used as the first container, the  
4 propellant used for the first container will not be  
5 introduced into the second container. It will not  
6 therefore affect the final product.

7  
8 If a liquified gas is used as the propellant in the  
9 second container, the vapour pressure of this gas can  
10 be determined by mixing quantities of liquified gases  
11 at various vapour pressures until the desired pressure  
12 is reached. Vapour pressure is that pressure at which  
13 the closed system is at equilibrium.

14  
15 This can be explained in more detail as follows:  
16 If a known volume of liquid gas is introduced into a  
17 vacuum at a given temperature T the liquified gas will  
18 boil and vaporize to occupy all of the available space  
19 in the container. The pressure in the container will  
20 rise as the gas expands. At equilibrium the remaining  
21 liquified gas will not have enough energy to vaporize  
22 and the pressure of the gaseous phase is not high  
23 enough to cause condensation of the gas. This  
24 equilibrium point can be measured as a stable pressure  
25 reading at the valve or entry point. A reduction in  
26 the volume of the container will lead to an increase in  
27 the volume of liquified gas and vice versa, but the  
28 pressure will remain constant at a given temperature.

29  
30 The liquified gas propellants give a constant pressure  
31 throughout the expulsion of products. They can also  
32 readily dispense thicker product more easily than  
33 compressed gas as their pressure will not decrease  
34 until all the liquid phase propellant has been  
35 expelled.

1 If a pressurised gas (air, nitrogen, etc) was used in  
2 the second container then the pressure fill would have  
3 to be lower than the first container to allow for a  
4 pressure increase when product is introduced from the  
5 first container. If the pressure equalises during the  
6 transfer flow of product will cease. As the product is  
7 dispensed the pressure in the second container will  
8 decrease and dispersion will be slowed.

9  
10 If the first container and the second container are  
11 standard aerosol canisters with no barrier type system,  
12 product and propellant from the first container will  
13 flow into the second container until equilibrium is  
14 reached in the two containers.

15  
16 The principles of the present invention could be used  
17 to mix contents from virtually any number of containers  
18 (so long as there is an appropriate pressure difference  
19 between one container and the next).

20  
21 The connection means of the present invention thus  
22 provides a means for mixing the contents of two or more  
23 separate aerosol containers together in one of the  
24 aforementioned aerosol containers. This is  
25 particularly useful when an aerosol dispenser is  
26 required to dispense a mixture of ingredients that  
27 would otherwise be too unstable to be stored in just  
28 one single aerosol container.

29  
30 The packaging system of the invention may comprise more  
31 than two containers which are successively connected  
32 together with connection means. Advantageously each  
33 container would be appropriately pressurised to drive  
34 its contents into the next container following  
35 activation of the connecting means linking the two

1 containers together, to form an admixture. Thus, the  
2 contents of the initial container will be transferred  
3 to its immediate neighbour and the admixture so formed  
4 will be subsequently transferred to the next container  
5 of the series. This process will be repeated until the  
6 final container contains the full admixture which can  
7 then be dispensed.

8

9 Embodiments of present invention will now be described  
10 by way of example and with reference to the  
11 accompanying drawings, in which:

12

13 Fig. 1 is a perspective view of a first embodiment of  
14 the connecting means of this invention;

15

16 Fig. 2 is a plan view from above of the connecting  
17 means of Fig. 1;

18

19 Fig. 3 is a cross-section of the connecting means of  
20 Fig. 2 taken along line A-A;

21

22 Fig. 4 is a plan view from below of the connecting  
23 means of Figs 1 to 3;

24

25 Fig. 5 is a cross-sectional view of the connecting  
26 means of Figs. 1 to 4 attached to a first container and  
27 ready to receive a second container;

28

29 Fig. 6 shows in cross-section the packaging system of  
30 Fig. 5 attached to a second container in storage mode;

31

32 Fig. 7 shows in cross-section the packaging system of  
33 Fig. 6 in dispensing mode;

34

35 Fig 8. is a perspective view of the packaging system

1 showing the connecting means of Figs. 1 to 7 attached  
2 to a first container and ready to receive a second  
3 container (equivalent to Fig. 5);  
4

5 Fig. 9 is a perspective view of the dispensing system  
6 attached to a first container and a second container,  
7 as the complete apparatus would be stored or  
8 transported;  
9

10 Fig. 10 is a cross-sectional view of one embodiment of  
11 the invention, when the connecting means is attached to  
12 two aerosol canisters in storage mode and indicating  
13 the contents of the two containers schematically;  
14

15 Fig. 11 is a cross-sectional view of the embodiment of  
16 Fig. 10, with the canisters are in dispensing mode and  
17 indicating the contents of the two containers  
18 schematically;  
19

20 Fig. 12 is a partial and exploded perspective view of a  
21 second embodiment of a connecting means of this  
22 invention showing a two-part connector;  
23

24 Fig. 13 is a perspective view of the first part of the  
25 connector shown in Fig. 12;  
26

27 Fig. 14 is the first part of the connector shown in  
28 Fig. 13 viewed from above;  
29

30 Fig. 15 is the first part of the connector shown in  
31 Fig. 13 viewed from below;  
32

33 Fig. 16 is a cross-sectional view of the first part of  
34 the connector shown in Fig. 14 along the line X-X;  
35

1 Fig. 17a is a side view of the first part of the  
2 connector shown partial cross-section (along line A-A  
3 of Fig. 14);  
4  
5 Fig. 17b is an enlarged detail (scale 1:5) of snap bead  
6 120 of the connector shown in Fig. 17a;  
7  
8 Fig. 17c is an enlarged detail (scale 1:5) of  
9 protuberance 112 of the connector shown in Fig. 17a;  
10  
11 Fig. 18 is an enlarged partial cross-sectional view  
12 (scale 2:1) of the first part of the connector shown in  
13 Fig. 14 and taken along the line A-A;  
14  
15 Fig. 19 is a perspective view of the second part of the  
16 connector shown in Fig. 12;  
17  
18 Fig. 20 is the second part of the connector shown in  
19 Fig. 19 viewed from above;  
20  
21 Fig. 21a is the second part of the connector shown in  
22 Fig. 19 viewed from below;  
23  
24 Fig. 21b shows an enlarged detail (scale 5:1) of the  
25 track 210 of the connector shown in Fig. 19;  
26  
27 Fig. 22 is a side view of the second part of the  
28 connector shown in Fig. 19;  
29  
30 Fig. 23a is a cross-sectional view of the second part  
31 of the connector shown in Fig. 20 along line B-B;  
32  
33 Fig. 23b is an enlarged detail (scale 2:1) of the knurl  
34 of the connector shown in Fig. 23a;  
35



1 Fig. 23c is an enlarged detail (scale 5:1) of the  
2 pathway 212 of the connector shown in Fig. 23a;

3  
4 Fig. 24 is the second part of the connector of Fig. 19  
5 shown attached to a second container and viewed from  
6 above;

7  
8 Fig. 25 is a longitudinal and cross-sectional view  
9 along line X-X of Fig. 24 of the connecting means shown  
10 in Fig. 12 in storage mode, and wherein a second  
11 container is shown attached to the second part of the  
12 connector, the two parts of the connector being  
13 connected together in a storage mode and with a tamper  
14 band provided;

15  
16 Fig. 26 is a cross-sectional view similar to Fig. 25  
17 except that the tamper band has been removed and that  
18 the cross sectional view is taken along line X'-X' of  
19 Fig. 24; and

20  
21 Fig. 27 is a cross-sectional view similar to Fig. 25  
22 except that the two parts of the connector have been  
23 positioned in dispensing mode and that the view is  
24 taken along lines A-A of Fig. 24.

25  
26 In more detail, Figs 1-4 show the connecting means 2 of  
27 the present invention, which is preferably formed from  
28 a single piece of plastics material. The connecting  
29 means 2 comprises a cylindrically shaped sleeve 6  
30 having at its bottom edge an inwardly projecting and  
31 essentially horizontal shelf 8. The inner edge of  
32 shelf 8 projects downwardly to form a sleeve 22 having  
33 a smaller internal diameter than major sleeve 6. The  
34 internal diameter of sleeve 6 is chosen to form a close  
35 fit with the second container of the invention. As

1 illustrated two circumferentially extending ridges 10,  
2 12 are located on the internal surface of sleeve 6 to  
3 promote a good grip between connecting means 2 and the  
4 second container (not shown).

5  
6 The internal diameter of smaller sleeve 22 is chosen to  
7 form a close fit with the top of first container of the  
8 present invention, which may conveniently be a  
9 conventionally sized neck collar of a commercially  
10 available aerosol canister.

11  
12 Figs 1-4 show a conduit extending through sleeve 6 at  
13 approximately the centre thereof. The conduit 14 is  
14 supported at its lower end by projections 16, 18 and 20  
15 which extend from the inner edge of shelf 8 to the  
16 conduit. In the embodiment illustrated only three  
17 projections are shown, but more projections may also be  
18 present. Preferably the projections are spaced  
19 equidistantly from each other. As is best seen in Fig  
20 3, the aperture of conduit 14 narrows at shoulder 15,  
21 the upper narrow portion of conduit 14 terminating in a  
22 blind ending 13. Small apertures 15a, 15b, 15c are  
23 present in conduit 14 and spaced equidistantly around  
24 shoulder 15. These apertures 15a, 15b and 15c are best  
25 seen in Figs 5-7.

26  
27 Figs 5-7 and 8-9 demonstrate how connecting means 2 may  
28 be used to connect the first and second containers. As  
29 shown in Fig 5 the connecting means 2 can be pressed on  
30 to the first container 24, the inner surface of sleeve  
31 22 forming a close fit with the external diameter of  
32 neck collar 26 on container 24. The internal diameter  
33 of the lower portion of conduit 14 is chosen to form a  
34 close fit with the standard valve 27 of container 24.  
35 Fig 5 shows a second container 28, having been aligned

1 with connecting means 2, moving in the direction of the  
2 arrows in order to connect therewith.

3  
4 As shown in Fig 6, the second container 28 is then  
5 located within the upper portion of sleeve 6 and the  
6 packaging system may be stored and/or transported in  
7 this position. In this position the bottom of  
8 container 28 is pushed as far as ridge 10 and the blind  
9 end 13 of conduit 14 is located directly beneath and  
10 abuts the Nicholson valve 30 sealing the bottom of the  
11 second container 28.

12  
13 Downward pressure is applied until the bottom of the  
14 second container 28 abuts ridge 10 of the sleeve 6 and  
15 the top of conduit 14 abuts the seal or Nicholson valve  
16 30. This is the storage/distribution mode of the  
17 packaging system 1.

18  
19 In order to activate the packaging system of the  
20 present invention and to initiate transfer of the first  
21 ingredient from the first container 24 into the second  
22 container 28, the second container is moved relative to  
23 the connecting means 2 into the position illustrated in  
24 Fig 7. As shown in Fig 7, conduit 14 has partially  
25 penetrated into the interior of container 28, the seal  
26 or Nicholson valve 30 being pushed inwardly and, as  
27 illustrated, retained upon the blind end 13 of conduit  
28 14. The valve 27 of first container 24 is activated by  
29 pushing that container, and thus valve 27, into conduit  
30 14 as far as shoulder 15. The presence of shoulder 15  
31 in conduit 14 causes the valve 27 to be activated and  
32 the pressure within the first container 24 is released,  
33 the propellant therein expanding and causing  
34 displacement of the first ingredient along the conduit  
35 14, through apertures 15a, 15b and 15c and into the

1 interior of the second container 28. Desirably, the  
2 apertures 15a, 15b, 15c are shaped, dimensioned and  
3 spaced to cause the first ingredient to be introduced  
4 into the interior of second container 28 in a spiral  
5 motion (eg having vortex characteristics) which causes  
6 admixture of the first and second ingredients.

7  
8 Fig 8 illustrates a connecting means 2 positioned onto  
9 a first container 24 and ready to receive the second  
10 container 28 which is moving in the direction of the  
11 arrows.

12  
13 Fig 9 illustrates the first and second containers 24,  
14 25 held in vertical juxtaposition by connecting means  
15 2. Moving the second container 28 in a downward motion  
16 would cause activation of the upper valve 27, (shown in  
17 Figs 10 and 11) on the first container 24 and  
18 displacement of the first ingredient into the second  
19 container 28. Activation of the valve 34 (not shown)  
20 on top of the second container 28 would then allow  
21 dispensation of the admixture of the first and second  
22 ingredients. As the packaging system 1 of the present  
23 invention is designed specifically to aid dispensation of  
24 ingredients which are normally incompatible during  
25 storage, complete deployment of the device would  
26 normally occur shortly after transfer of the first  
27 ingredient into the second container.

28  
29 Figs 10 and 11 show in schematic cross-section, the  
30 transfer of the first ingredient 25 from the first  
31 container 24 into the second container 28, to form an  
32 admixture 29 with the second ingredient. As shown, the  
33 first container 24 initially contains the first  
34 ingredient 25 (for example a foamable gel) separated  
35 from a pressurized propellant 32 (such as nitrogen

1 gas/liquid system) by a piston 4. Upon activation of  
2 valve 27 located at the top of container 24, as caused  
3 by the relative movement of containers 24, 28 together,  
4 the pressure of container 24 is released and propellant  
5 32 expands driving a piston 4 upwardly and pushing  
6 first ingredient 25 through valve 27, conduit 14 and  
7 into the interior of the second container 28 via  
8 apertures 15a, 15b and 15c.

9  
10 In the embodiment illustrated in Figs 10 and 11, the  
11 second container 28 initially holds the second  
12 ingredient 29 (which may be for example a powdered  
13 active ingredient) and a gas/liquid pressure system of  
14 a propellant 33. Initially the propellant 33 comprises  
15 a significant volume of propellant in gaseous form, but  
16 upon the introduction of the first ingredient 25, at  
17 least part of the gaseous propellant is converted into  
18 liquid. In Fig 11 the first and second ingredients  
19 have formed an intimate admixture 31. Admixture 31 is  
20 dispelled from the packaging system 1 by activation of  
21 valve 34 located on the upper end of container 28.

22  
23 Referring now to Figs. 12 to 27 there is shown a second  
24 preferred embodiment of the invention wherein the  
25 connecting means is a two-part connector 101. As shown  
26 in the exploded view of Fig. 12 the connector 101 has a  
27 first part 100 which is designed to be immovably  
28 attached to a first container provided with a standard  
29 valve 300 and a second part 200 which is designed to be  
30 immovably attached to a second container 202.

31  
32 Figs. 13 to 18 show the details of the first part 100  
33 of the connector 101. More particularly Figs. 13 to 18  
34 illustrate that the first part 100 comprises a  
35 cylindrically shaped sleeve 106 having at its bottom

1 edge an inwardly projecting and essentially horizontal  
2 shelf 108. The internal diameter of sleeve 106 is  
3 chosen to co-operate with the second part 200 of  
4 connector 101 of the invention.

5  
6 The shelf 108 is pierced by apertures 126, 128 which  
7 are each provided below protuberances 110 and 112  
8 located on the inner wall of the sleeve 106.  
9 Advantageously abutments 124 are provided on the upper  
10 surface of the shelf 108, projecting upwardly from the  
11 latter and inwardly from the inner wall of the sleeve  
12 106. These abutments 124 limit the extent of insertion  
13 of the second part 200 of the connector 101 when the  
14 second part 200 is introduced into the sleeve 106.

15  
16 Of course, whilst the embodiment illustrated contains  
17 six abutments 124 arranged equidistantly around shelf  
18 108, fewer or greater numbers of abutments 124 may be  
19 present if desired. Preferably the abutments 124 are  
20 spaced equidistantly from each other.

21  
22 As illustrated in Figs. 13-17, two protuberances 110,  
23 112 are located on the internal surface of sleeve 106  
24 and these form a part of a locking system between the  
25 two parts 100 and 200 of the connector 101 which will  
26 be further described below. Fig. 17C shows in detail a  
27 preferred shape of protuberance 112. A corresponding  
28 shape would be used for the other protuberance 110.

29  
30 A fluted band 103, which can be made of equidistantly  
31 spaced ribs, is provided around the outer surface of  
32 the sleeve 106 and advantageously provides a good  
33 gripping surface for the user.

34  
35 As best shown in Fig. 16, the inner edge of shelf 108

1 projects downwardly to form a sleeve 122 having a  
2 smaller internal diameter than sleeve 106. The  
3 internal diameter of sleeve 122 is chosen to form a  
4 close fit with the top of the first container 102 which  
5 may conveniently be a conventionally sized neck collar  
6 of a commercially available aerosol canister. A snap  
7 bead 120, best shown in Fig. 17, is advantageously  
8 provided at the bottom edge of the sleeve 122 to  
9 provide improved fitting with the neck collar of the  
10 first container 102.

11

12 At the upper portion of sleeve 122 a number of small  
13 ribs 119, best shown in Figs. 15, 16 and 18, are  
14 positioned projecting downwardly into the aperture of  
15 sleeve 122 and which are preferably equidistantly  
16 spaced from each other. These small ribs 119 act both  
17 as reinforcing members and spacing abutments with  
18 respect to the top of the first container 102.

19

20 Figs. 13 to 18 illustrate a conduit 114 extending  
21 partially along the aperture sleeve 106 and located at  
22 approximately the centre thereof. The conduit 114 is  
23 supported at its lower end by six (preferably  
24 identical) projections 116 which extend from the inner  
25 edge of shelf 108 to the conduit 114. Of course,  
26 greater or fewer numbers of projections 116 may be  
27 present if desired. Preferably the projections 116 are  
28 spaced equidistantly from each other.

29

30 The internal diameter of the conduit 114 is chosen to  
31 form a close fit with the dispensing tube of the first  
32 container 102 which is conveniently sized and shaped as  
33 a commercially available aerosol canister dispensing  
34 tube. Alternatively, the lower end of conduit 114 may  
35 terminate in an adaptor which is able to form the

1 required close fit. Longitudinal reinforcing ribs 118  
2 (shown in Fig. 18) are present on the inner wall of  
3 conduit 114 and may extend substantially along the  
4 length of the interior of conduit 114. Preferably  
5 there are three equidistantly spaced ribs 118.

6  
7 As it is best seen in Figs. 16 and 18, the thickness of  
8 the wall of conduit 114 may narrow at shoulder 115  
9 reducing the external diameter whilst maintaining the  
10 aperture diameter. The upper portion of conduit 114  
11 then terminates in a blind ending 113 which is of  
12 smaller cross-sectional area than conduit 114. Small  
13 apertures 117 are located in and spaced equidistantly  
14 around conduit 114. The apertures are located between  
15 shoulder 115 and blind end 113, and in this portion of  
16 conduit 114 narrows further, sloping inwardly to the  
17 blind end 113. As best shown in Fig. 15, the  
18 embodiment illustrated has three apertures 117 but this  
19 can of course be varied if required.

20  
21 Figs. 19 to 24 show the details of the second part 200  
22 of the connector 101.

23  
24 The second part 200 of the connector 101 is sized and  
25 shaped to be located onto the bottom of a second  
26 container 202 in a tight fit arrangement. The second  
27 container 202 is sealed on its bottom surface by a bung  
28 290 (for example a rubber bung or Nicholson valve) (see  
29 Figs. 25-27).

30  
31 As illustrated in Fig. 19, the second part 200  
32 comprises a cylindrically shaped sleeve 206 having at  
33 its inner bottom edge several ribs 208 which project  
34 inwardly into the aperture of sleeve 206 and are of  
35 arcuate form. The internal diameter of sleeve 206 is



1 chosen to form a close fit with the bottom of the  
2 second container 202. Advantageously the second part  
3 of the connector 101 is sized and shaped to receive the  
4 bottom of the second container in a close fit manner.  
5 The ribs 208 act as an additional attachment means and  
6 cooperate with the bottom end of the second container  
7 202 in a snap bead manner.

8  
9 The external diameter of sleeve 206 is chosen to be  
10 generally smaller than the internal diameter of sleeve  
11 106 of the first part 100 of the connector 101. However  
12 the external diameter of the bottom part of the sleeve  
13 206 is chosen so as to be generally larger than the  
14 internal diameter (taking into account the width of the  
15 protuberances 110, 112 of the locking system) of sleeve  
16 106. For example, in this particular embodiment, the  
17 bottom end of the external surface of the sleeve 206 is  
18 provided with several successive curved and protruding  
19 ribs 216 which increase the external diameter of the  
20 sleeve 206.

21  
22 Two other sets of ribs 209, 211 and 213, 215 which  
23 define two pathways or tracks 210 (shown in Figs. 21-  
24 22) and 212 along the external surface of the bottom  
25 part of the sleeve 206 interrupt the ribs 216. Such  
26 pathways 210, 212 are sized and positioned to engage  
27 the two corresponding protuberances 110 and 112  
28 provided inside the sleeve 106. Upon rotation of at  
29 least one of the two parts 100 or 200 of the connector  
30 101, the protuberances 110, 112 are located at the  
31 entrance of their respective pathway 210, 212. Upon  
32 further rotation associated with reasonable pressure  
33 applied to the each or both parts 100, 200 of the  
34 connector 101 the protuberances 110, 112 are moved  
35 further along the pathways 210, 212 until the sleeve

1 206 becomes further positioned within the sleeve 106 to  
2 a pre-set maximum distance and the two parts 100, 200  
3 of the connector 101 become locked together at a given  
4 position which is determined by the pathways 210 and  
5 212. In this primed position, the blind end 113 has  
6 been pushed against the bung or Nicholson 290 valve  
7 sealing the bottom surface of the second container,  
8 displacing the bung or Nicholson valve 290 inwardly  
9 into the interior of that container 202. In this  
10 position apertures 117 are located within the cavity of  
11 container 202 such that material dispensed from  
12 container 102 would be dispensed therethrough.

13  
14 Desirably when the two parts 100, 200 of the connector  
15 are in the primed position it is not possible to simply  
16 rotate these parts in the opposite direction to unlock  
17 them from each other, but rather the shape and size of  
18 protuberances 110, 112 and pathways 210, 212 means that  
19 the two connectors become firmly "locked" together.

20  
21 Preferably the ribs 209, 211, 213, 215 and 216 which  
22 are provided on the external surface of the bottom end  
23 of the sleeve 206 are of a given width which allows  
24 close fitting of the sleeves 106, 206 of the two parts  
25 100, 200 of the connector 101.

26  
27 As best shown in Fig. 22 fluted band 203 may be  
28 provided externally on the upper portion of the sleeve  
29 206 to provide a good grip for the user's hand.

30  
31 Figs. 25 to 27 show the first part 100 and the second  
32 part 200 attached to the second container 202 in  
33 different connecting positions.

34  
35 The first part 100 can be pressed on to the first

1 container 102, the inner surface of sleeve 122 forming  
2 a close fit with the external diameter of the neck  
3 collar provided on the first container 102 (not shown  
4 in Figs. 25 to 27). The internal diameter of the lower  
5 portion of conduit 114 is chosen to form a close fit  
6 with the standard valve 300 of container 102 (shown in  
7 Fig. 12 and which may be similar to the valve 27 of the  
8 previous embodiment (see Fig. 5).

9  
10 Figs. 25 to 27 show three positions that can be adopted  
11 by the connecting means 101, namely storage position,  
12 ready to be connected position and dispersing position.  
13 In Figs. 25 to 27 only a portion of container 202 is  
14 shown, and the first container 102 is not represented.

15  
16 Fig. 25 shows the connecting means 101 and a second  
17 container 202, attached to the second part 200 of the  
18 connector 101. Part 200 is positioned inside sleeve 106  
19 of the first part 100, but the locking protuberances  
20 110, 112 are not aligned with the entrance of the  
21 pathways 210 and 212 (not shown in that Figure). In the  
22 position illustrated the blind end 113 of conduit 114  
23 is located directly beneath and abuts the bung or  
24 Nicholson valve 290 sealing the bottom of the second  
25 container 202. A tamper band 302 can be provided  
26 between the two parts 100, 200 of the connector 101 in  
27 order to maintain them in that position and so that the  
28 packaging system may be then stored and/or transported  
29 without disturbance. This is the storage/distribution  
30 mode of the packaging system according to this  
31 embodiment of the invention.

32  
33 To connect the two containers 102, 202 together the  
34 tamper band 302 has to be removed as shown in Fig. 26.

35

1 As shown in Fig. 27, and explained above, upon rotation  
2 of at least one of the parts 100, 200 of the connector  
3 101 the locking protuberances 110, 112 are positioned  
4 facing the corresponding pathways 210, 212. Upon  
5 further rotation and appliance of reasonable pressure  
6 the bottom of second container 202 is then pushed as  
7 far as the end of pathways 210, 212. Apertures 126,  
8 128 in the shelf 108 of the first part 100 of the  
9 connector permit the air present in the space between  
10 the two parts 100, 200 of the connector 101 to evacuate  
11 quickly.

12  
13 The conduit 114 is thus forced against bung or  
14 Nicholson valve 290, displacing it inwardly into the  
15 interior of container 202 and the packaging system of  
16 the present invention is ready for use. The transfer of  
17 the first ingredient from the first container 102 into  
18 the second container 202 may then be initiated, when  
19 required, simply by pressing the first container 102  
20 against the connector 101, thus actuating the valve 300  
21 of container 102 and causing transfer of the first  
22 ingredient into the second container via conduit 114  
23 and apertures 117.

24  
25 Desirably, the apertures 117 are shaped, sized and  
26 spaced to cause the first ingredient to be introduced  
27 into the interior of the second container 202 in a  
28 spiral motion (eg having vortex characteristics) which  
29 causes admixture of the first and second ingredients.

30  
31 The second container 202 is advantageously provided at  
32 its upper end with any suitable kind of dispensing  
33 system which permit the user to obtain the desired  
34 mixture of the two elements.

## 1 CLAIMS

2

3 1. A packaging system comprising :

4 a) a first container having a valve controlling  
5 the opening of an outlet and containing a first  
6 ingredient; and7 b) a second container having a openable entry  
8 portion, containing a second ingredient;  
9 and10 c) means for connecting said first and second  
11 containers together in order to allow said first  
12 ingredient to be displaced from said first  
13 container into the second container via the entry  
14 portion thereof, so that said first and second  
15 ingredients are admixed in said second container  
16 to form a final product.

17

18 2. A packaging system as claimed in Claim 1,  
19 wherein said first and second containers are  
20 each pressurised aerosol containers and  
21 wherein the initial pressure in the second  
22 container is less than that in the first  
23 container.

24

25 3. A packaging system as claimed in either one  
26 of Claims 1 and 2, wherein said connecting  
27 means comprises a conduit to transfer said  
28 first ingredient into said second container.

29

30 4. A packaging system as claimed in any one of  
31 Claims 1 to 3, wherein said openable entry  
32 portion is located in the bottom of said  
33 second container.

34

35 5. A packaging system as claimed in any one of

- 1           Claims 1 to 4, wherein said openable entry  
2           portion is a Nicholson valve or a bung.  
3
- 4       6.   A packaging system as claimed in any one of  
5           Claims 1 to 5, wherein said first container  
6           is positioned beneath the second container  
7           and connected thereto via the connecting  
8           means.  
9
- 10      7.   A packaging system as claimed in any one of  
11           Claims 3 to 6, wherein said conduit is shaped  
12           to co-operate with the valve of the first  
13           container.  
14
- 15      8.   A packaging system as claimed in any one of Claims  
16           1 to 7 wherein said valve of said first container  
17           is a directionally biased pressure activated  
18           valve.  
19
- 20      9.   A packaging system as claimed in any one of  
21           Claims 3 to 8, wherein said conduit is shaped  
22           and sized to facilitate the admixture of the  
23           first and second ingredients within the  
24           second container.  
25
- 26      10.  A packaging system as claimed in any one of  
27           Claims 3 to 9, wherein said conduit  
28           terminates in a blind ending and possesses  
29           multiple openings in the side of said  
30           conduit, generally adjacent the blind ending  
31           thereof.  
32
- 33      11.  A packaging system as claimed in Claim 10,  
34           wherein the conduit openings are shaped and  
35           dimensioned to dispense the first ingredient

- 1           in a spiral flow so as to promote admixture  
2           of the first and second ingredients.  
3
- 4       12. A packaging system as claimed in any one of  
5           Claims 1 to 11, wherein said connecting means  
6           comprises a first sleeve projecting  
7           downwardly which engages the top of the first  
8           container and a second sleeve projecting  
9           upwardly which engages the bottom of the  
10          second container.  
11
- 12       13. A packaging system as claimed in Claim 12,  
13           wherein said first and second sleeves are  
14           sized and shaped to form a close fit with  
15           each of said containers.  
16
- 17       14. A packaging system as claimed in any one of  
18           Claims 1 to 13, wherein said container is a  
19           one piece unit.  
20
- 21       15. A packaging system as claimed in Claim 12,  
22           wherein said connecting means comprises at  
23           least a first part and a second part which  
24           are rotatable relative to each other, said  
25           first part comprising said conduit and said  
26           first and second sleeves, and said second  
27           part comprising a third sleeve secured to the  
28           bottom of the second container, said second  
29           and third sleeves having corresponding screw  
30           threads, allowing said second and third  
31           sleeves to be moved from a first position  
32           where the conduit is not actuating said  
33           openable entry portion to a second position  
34           where said conduit actuates said openable  
35           entry portion.

- 1 16. A packaging system as claimed in Claim 15,  
2 wherein said connecting means comprises a  
3 ratchet mechanism to prevent reversal of the  
4 rotation of the first and second parts.  
5
- 6 17. A packaging system as claimed in any one of  
7 Claims 15 to 16, wherein said rotation of the  
8 first and second parts relative to each other  
9 is through approximately 120°.  
10
- 11 18. A packaging system as claimed in any one of  
12 Claims 1 to 17, wherein said second container  
13 has a top mounted actuator which controls the  
14 dispensation of its contents.  
15
- 16 19. A packaging system as claimed in any one of  
17 Claims 1 to 18, wherein said second  
18 ingredient is a powder and wherein said first  
19 ingredient is a gel.  
20
- 21 20. A packaging system as claimed in any one of  
22 Claims 1 to 19, wherein the outlet of said  
23 first container is a one-way valve.  
24
- 25 21. A packaging system as claimed in any one of  
26 Claims 1 to 20, wherein said second container  
27 contains a propellant which is also an  
28 excipient of the final product.  
29
- 30 22. A packaging system as claimed in any one of  
31 Claims 1 to 21, wherein said connecting means  
32 is made of plastics material.  
33
- 34 23. A packaging system as claimed in any one of  
35 Claims 1 to 22, wherein said first container



- 1 is chosen from the group consisting of a  
2 piston-style aerosol container where said  
3 first ingredient is separated from the  
4 propellant gas by a piston and a bag-in-can  
5 aerosol container where the first ingredient  
6 is separated from the propellant by a bag.  
7
- 8 24. A packaging system as claimed in any of Claims 1  
9 to 23, wherein said second container contains a  
10 propellant gas which does not react with the first  
11 and second ingredients.  
12
- 13 25. A packaging system as claimed in any of Claims 3  
14 to 24, wherein the conduit cooperates with said  
15 valve of the second container so that when the  
16 valve is opened, the conduit permits entry of the  
17 first ingredient into the second container to take  
18 place.  
19
- 20 26. A packaging system as claimed in any one of  
21 Claims 1 to 25, wherein the second container  
22 has a bottom-mounted Nicholson valve which is  
23 removed or displaced into the second  
24 container by said conduit to allow the entry  
25 of the first ingredient into the second  
26 container.  
27
- 28 27. A packaging system as claimed in any one of Claims  
29 1 to 26, wherein means to actuate the displacement  
30 of said first ingredient to said second container  
31 comprises means to hold the first and second  
32 containers in suitable juxtaposition.  
33  
34

1 / 20

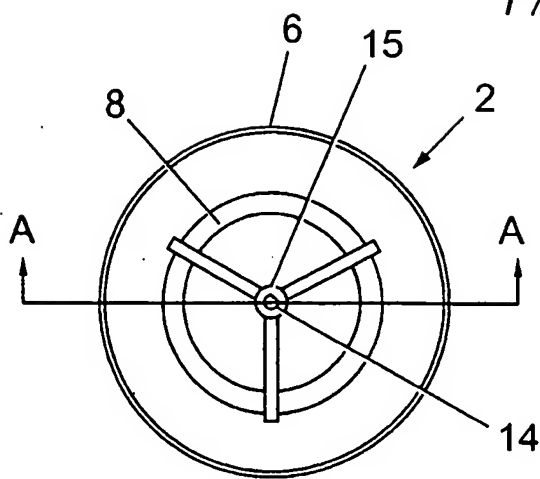


Fig. 2

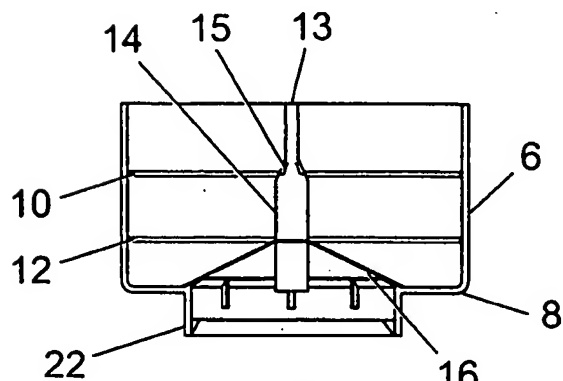


Fig. 3

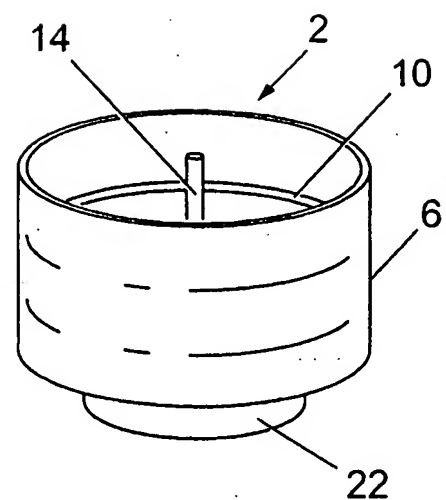


Fig. 1

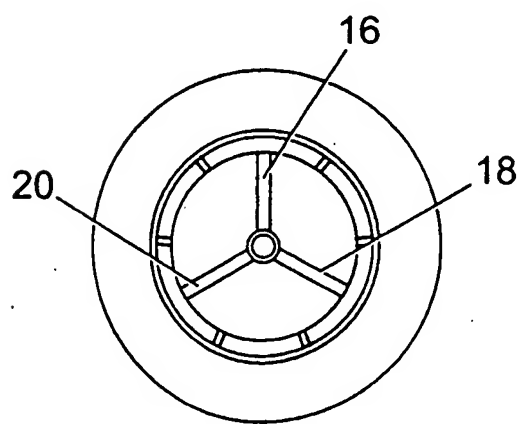
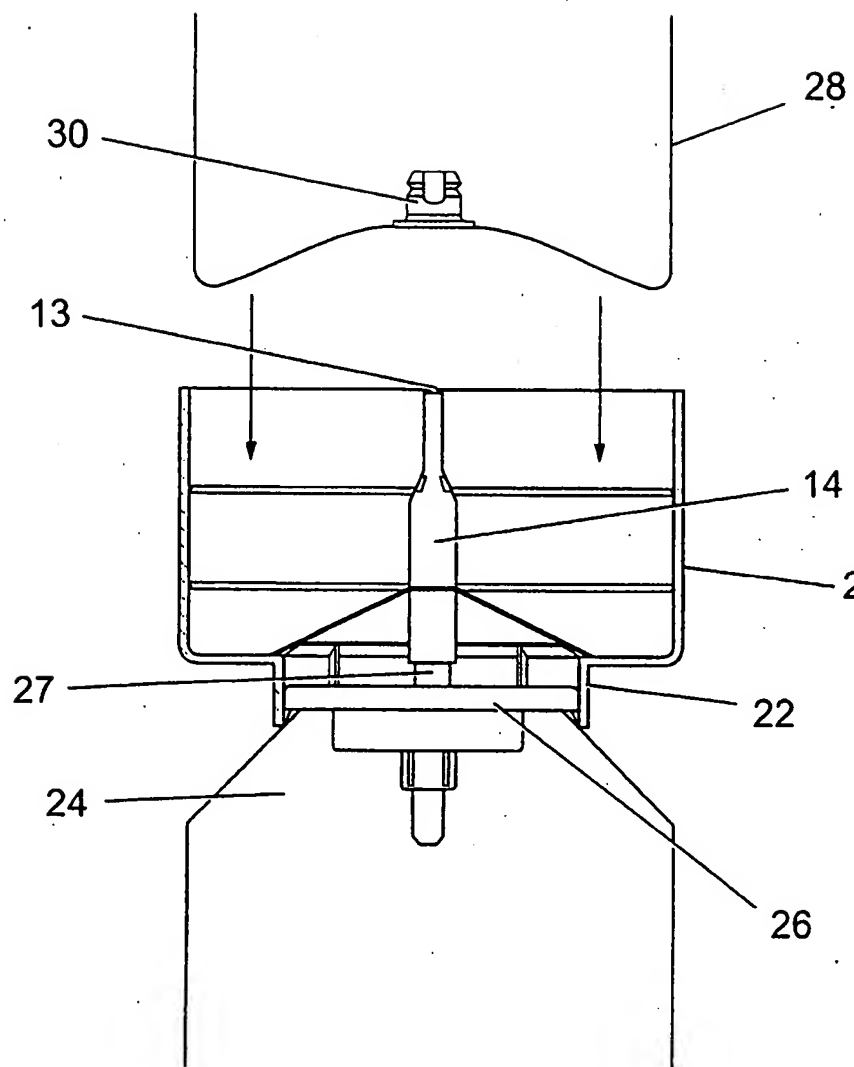
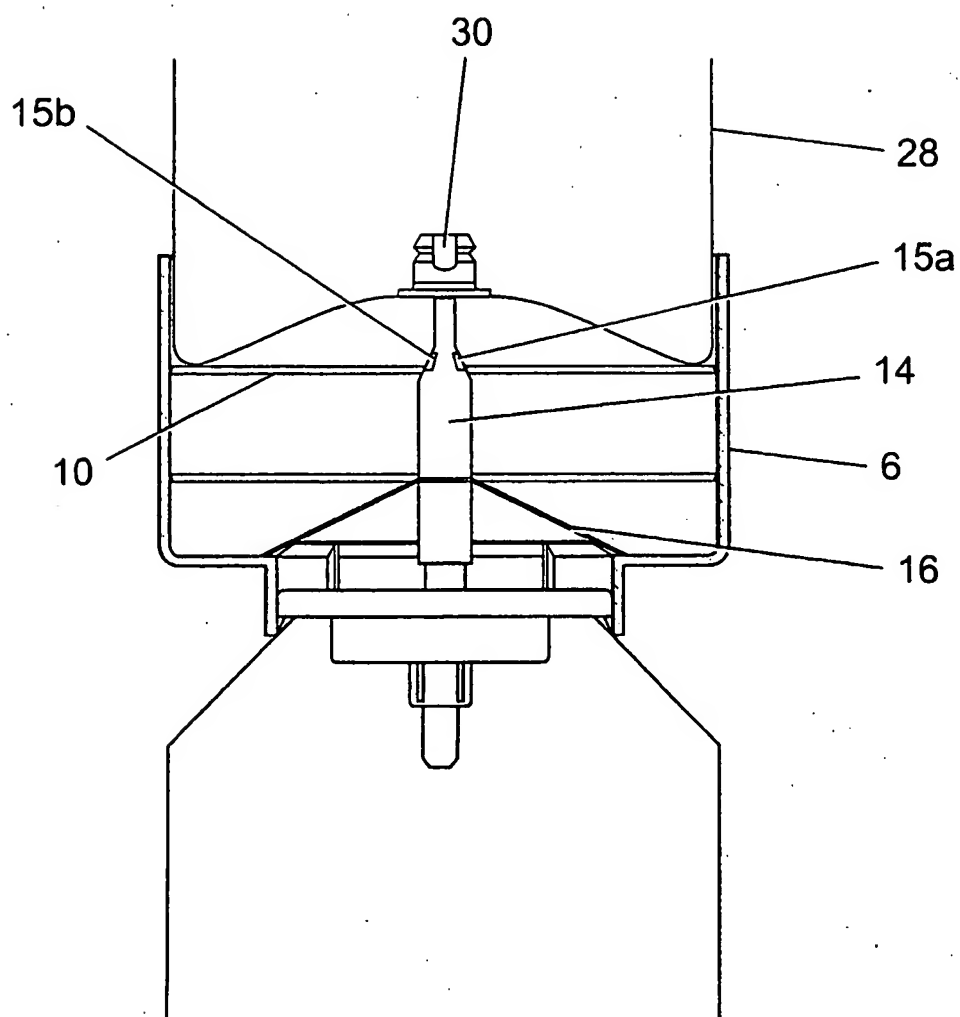


Fig. 4

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*Fig. 5*

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*Fig. 6*

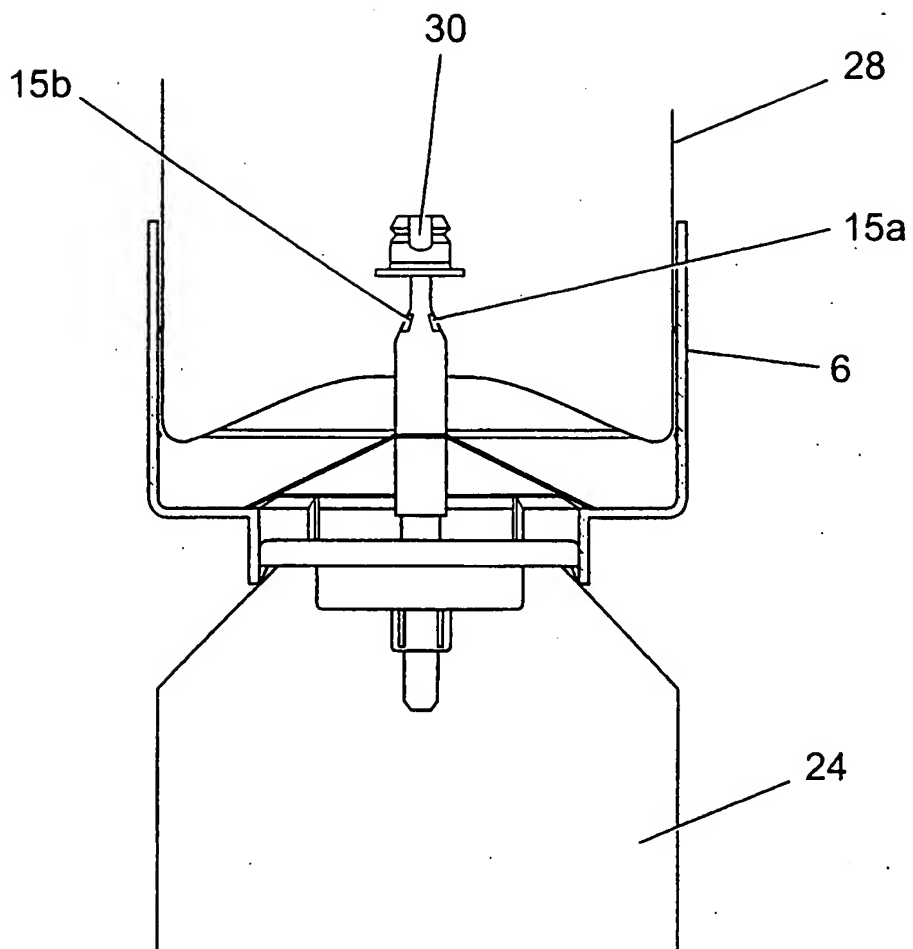


Fig. 7

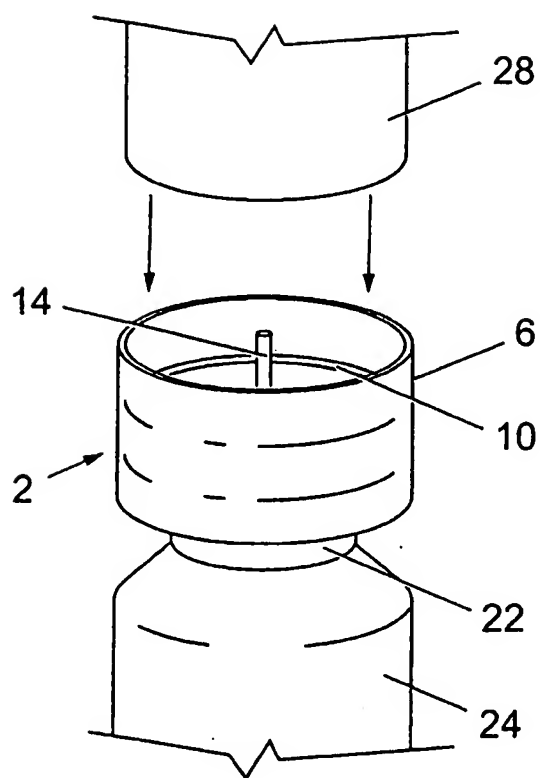


Fig. 8

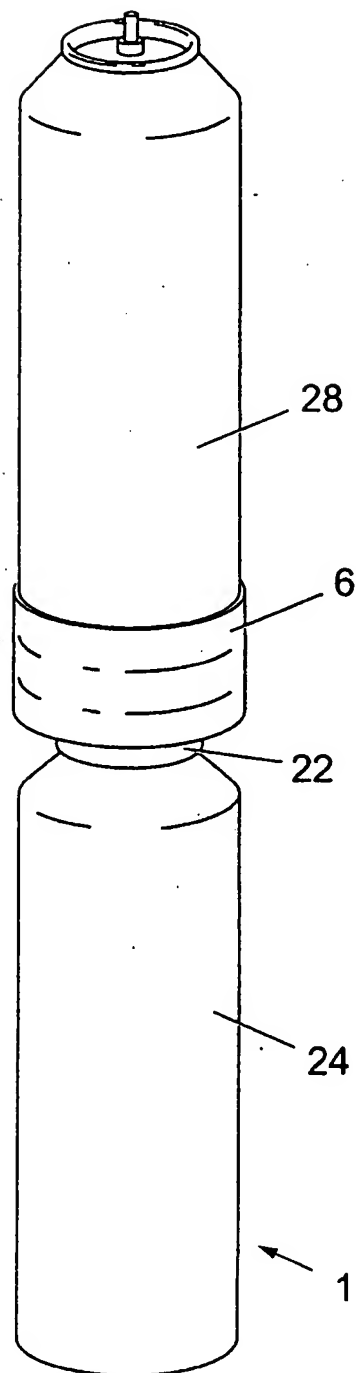


Fig. 9

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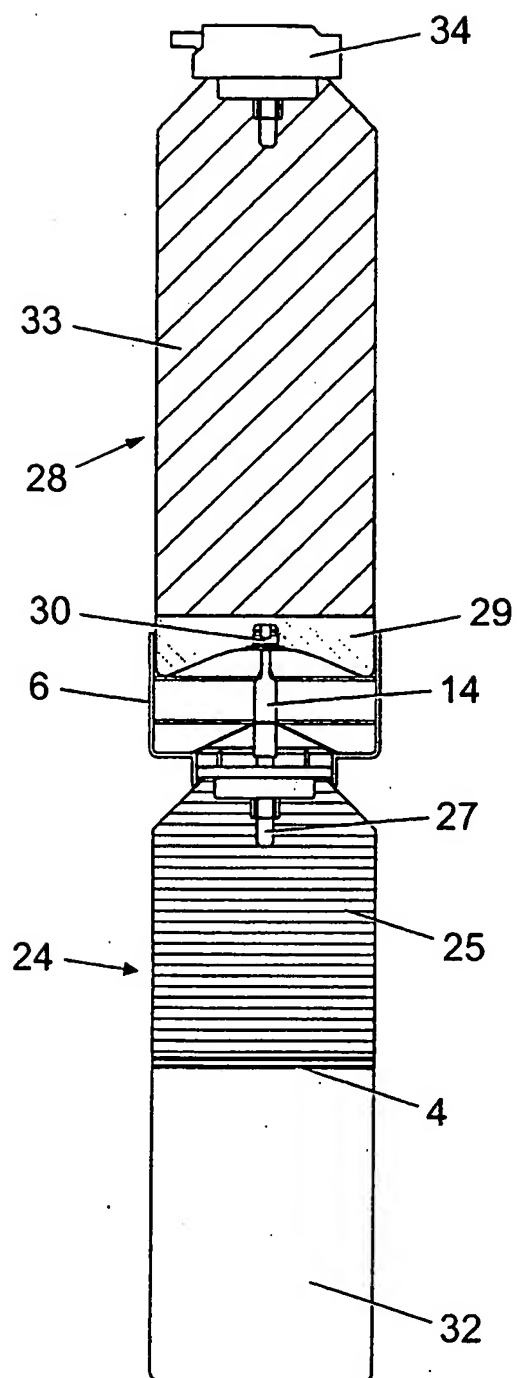


Fig. 10

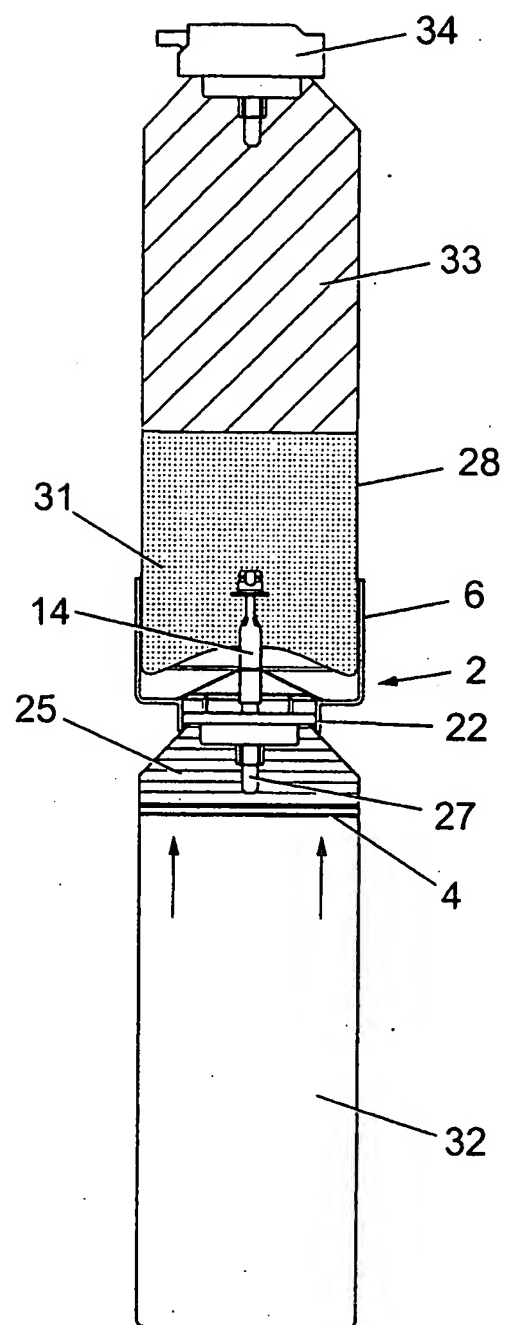


Fig. 11

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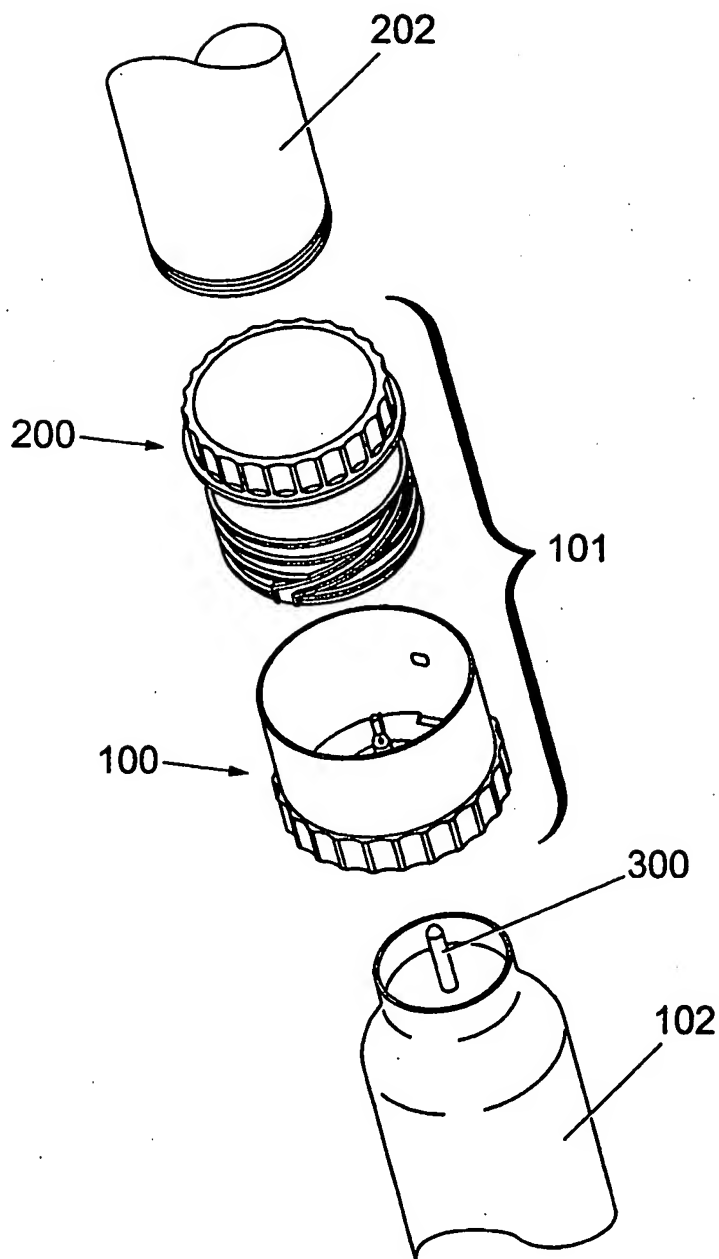
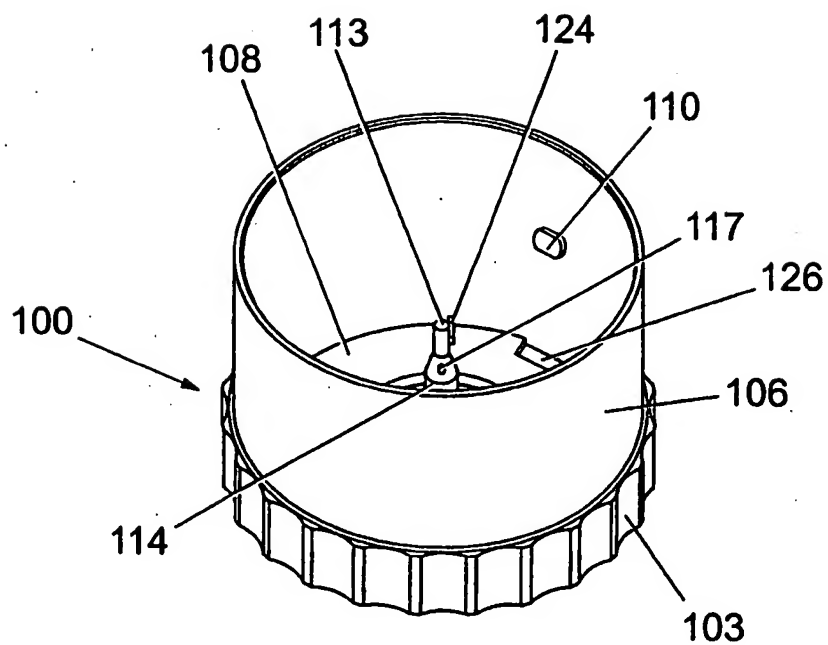


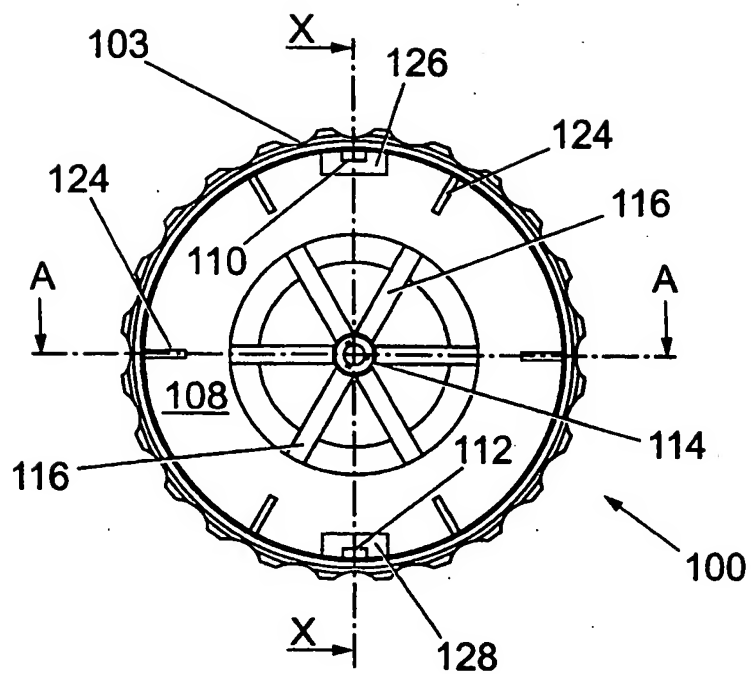
Fig. 12



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*Fig. 13*

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*Fig. 14*

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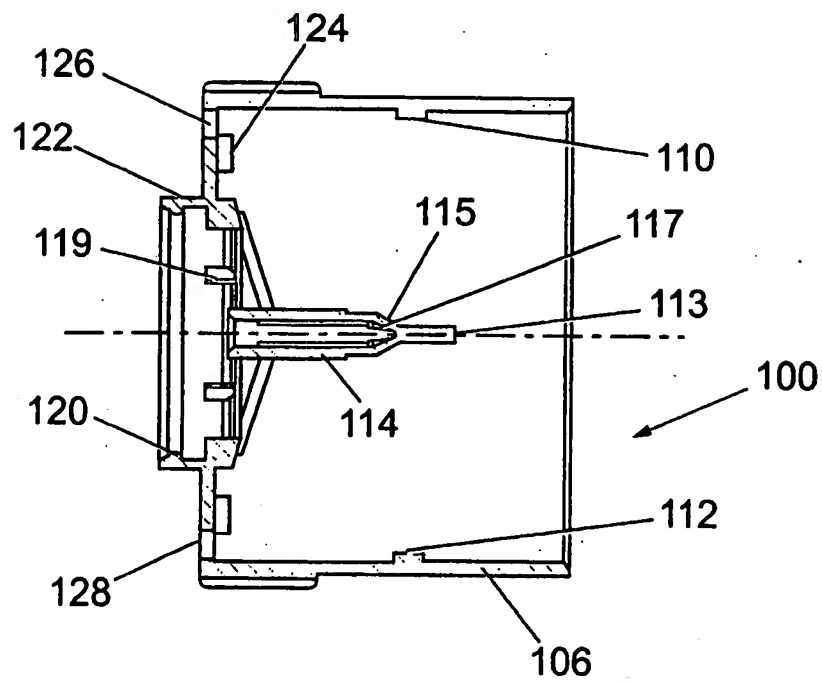
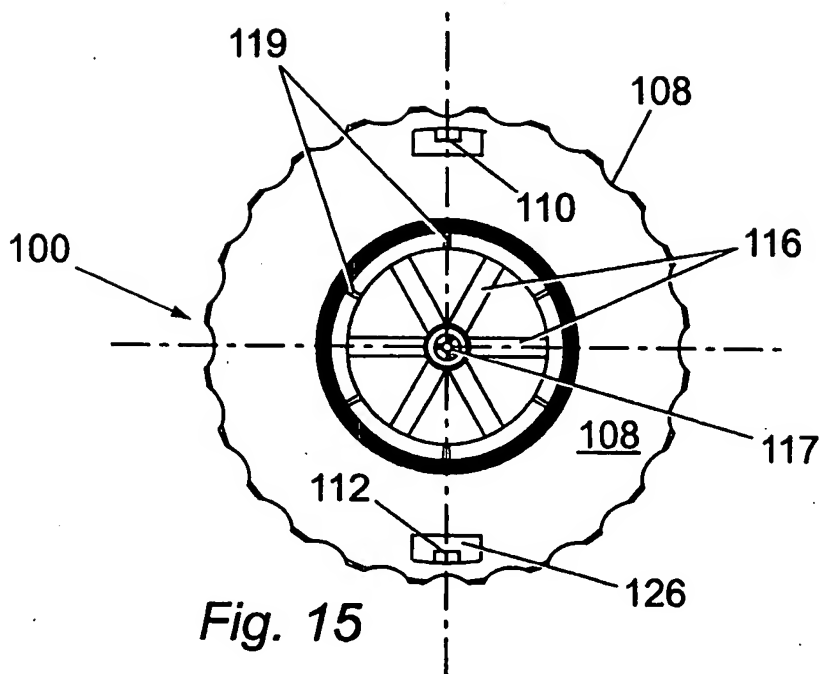


Fig. 16

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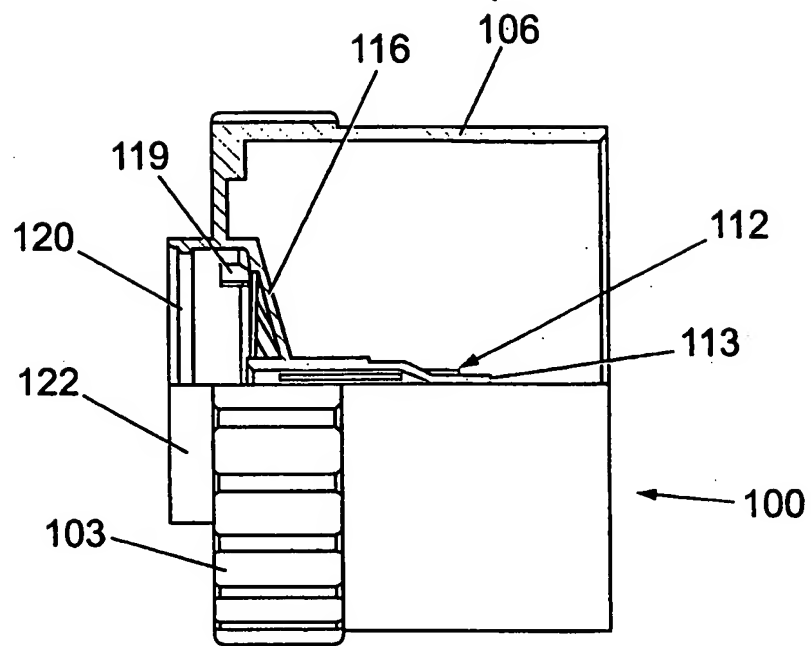


Fig. 17a

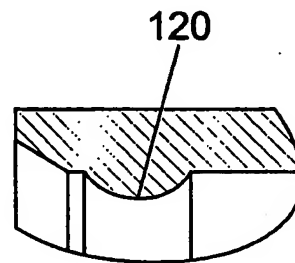


Fig. 17b

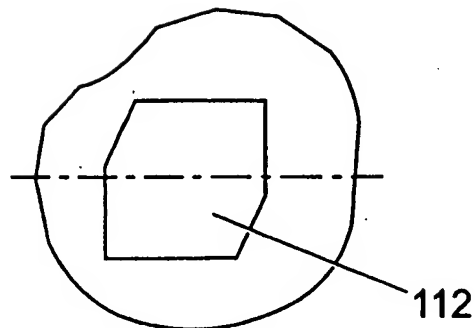
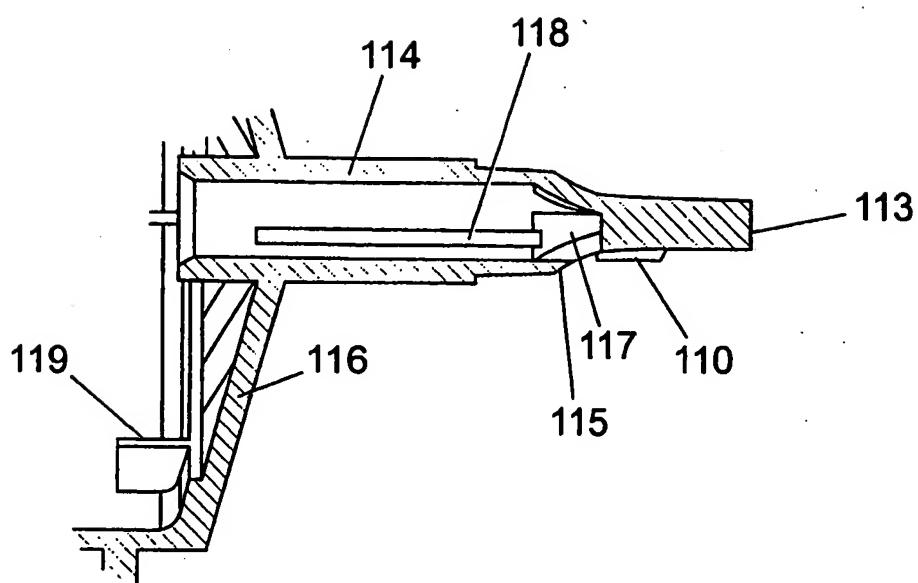


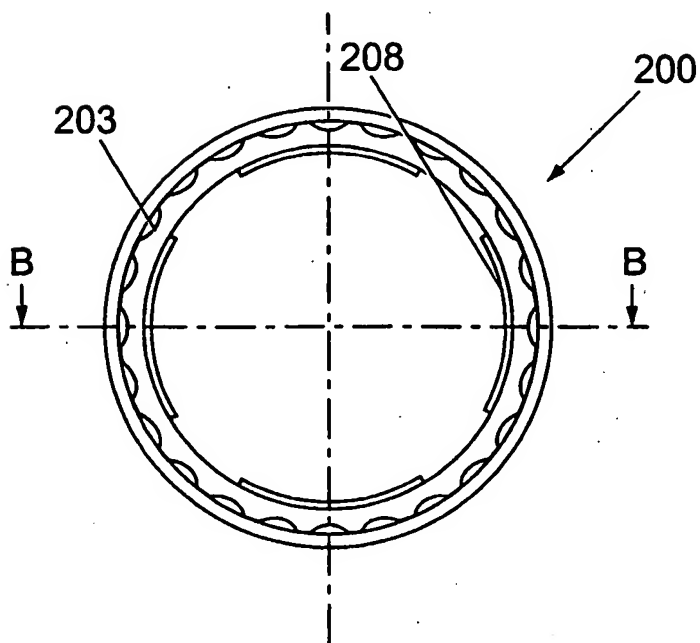
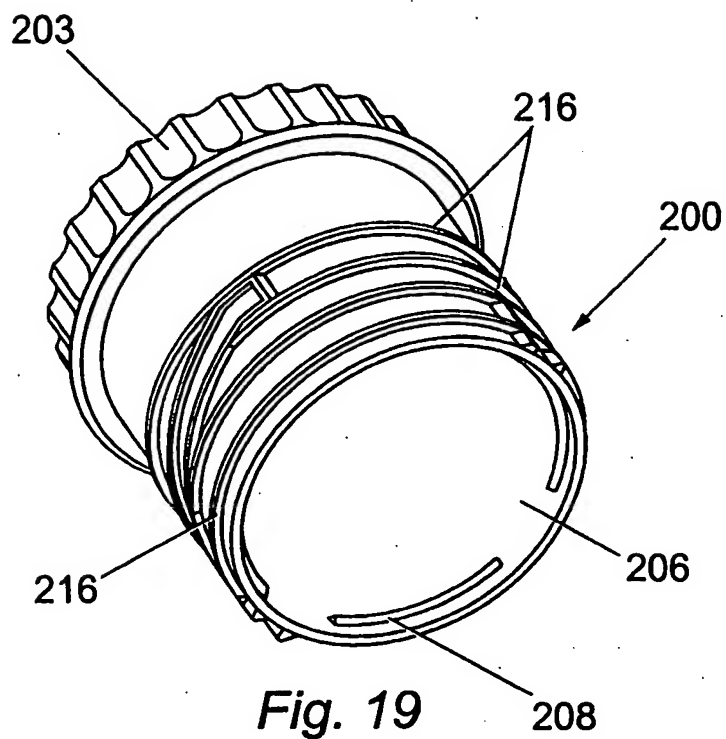
Fig. 17c

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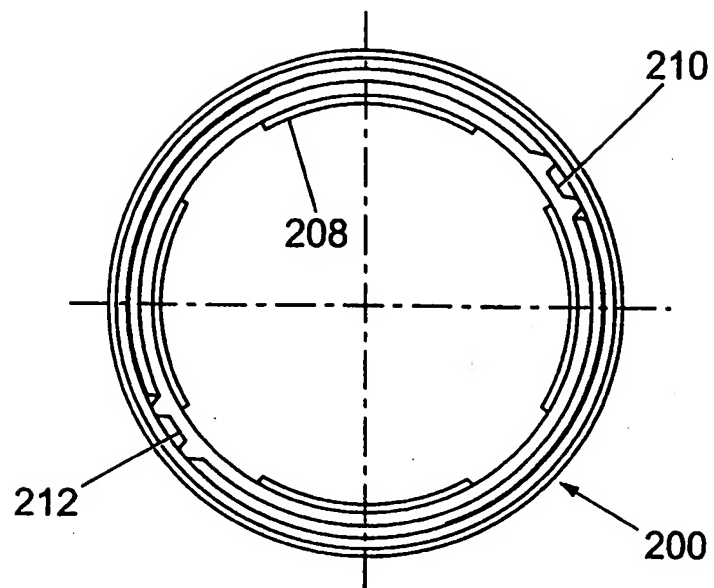


*Fig. 18*

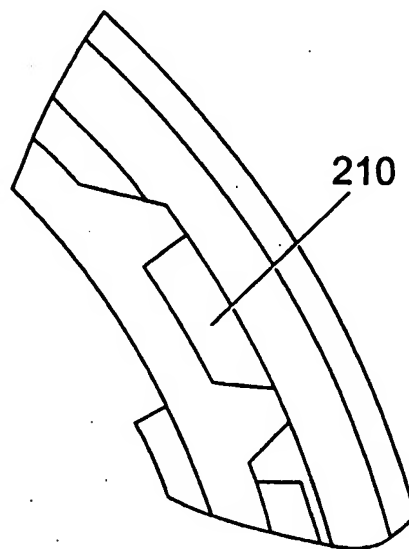
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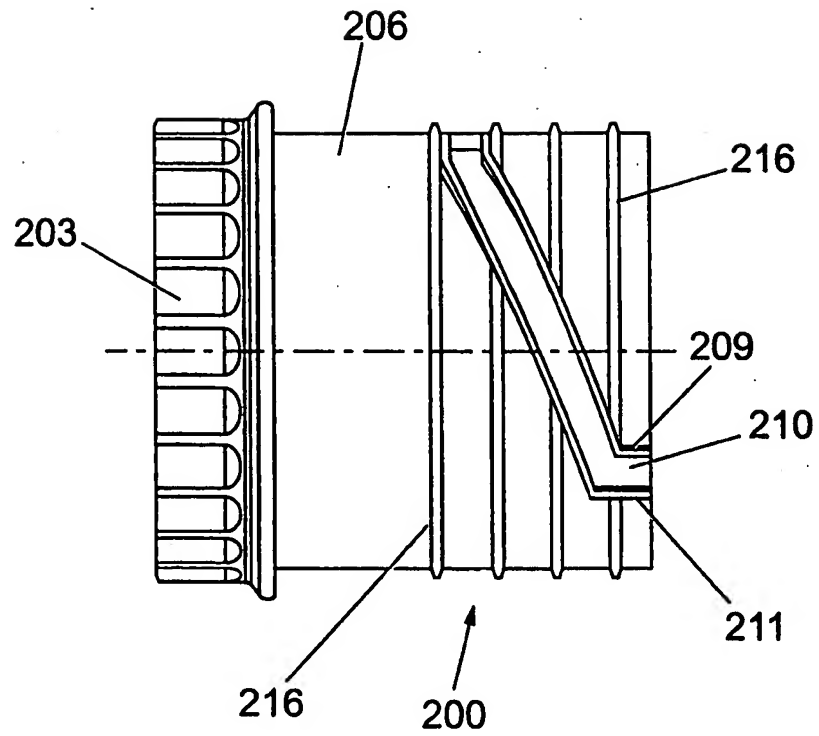


*Fig. 21a*



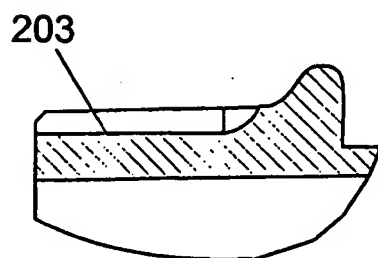
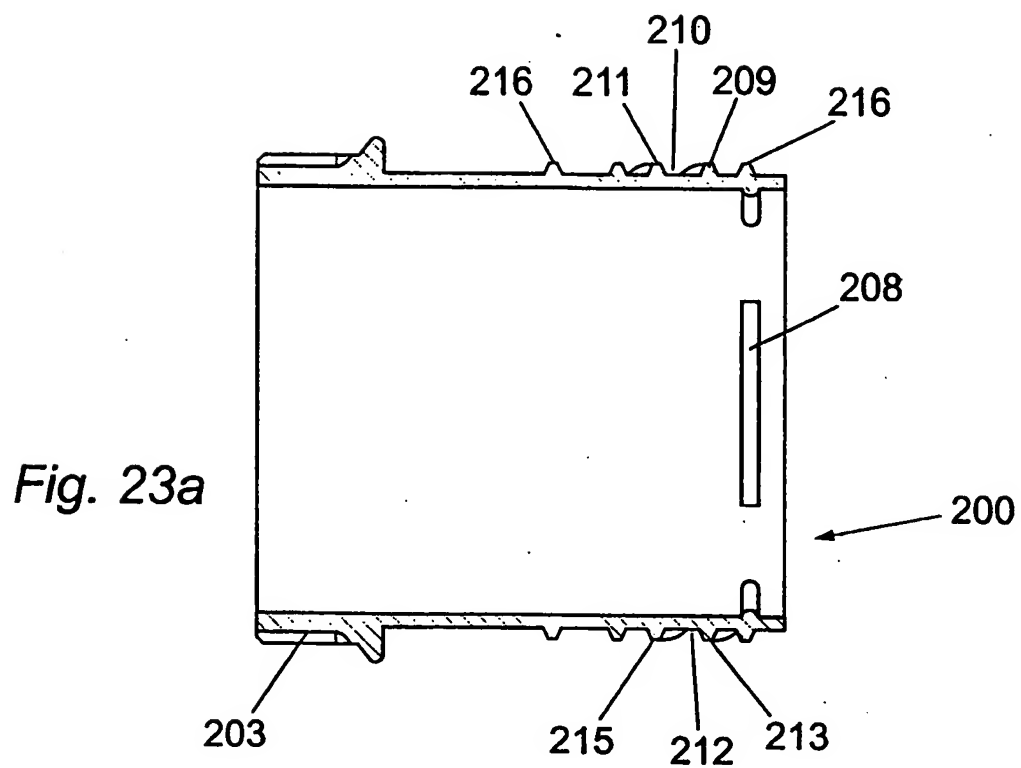
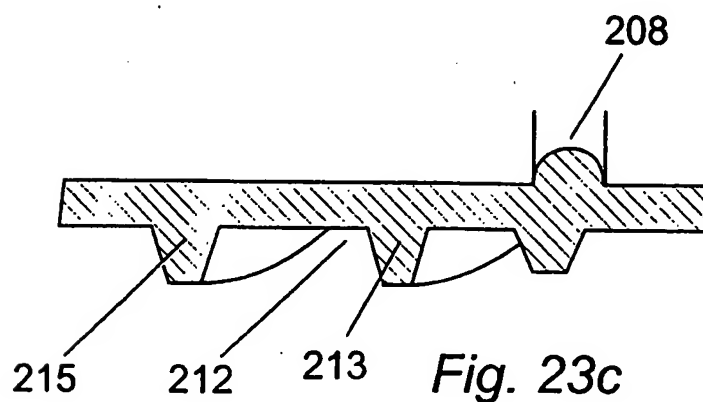
*Fig. 21b*

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*Fig. 22*



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*Fig. 23b*

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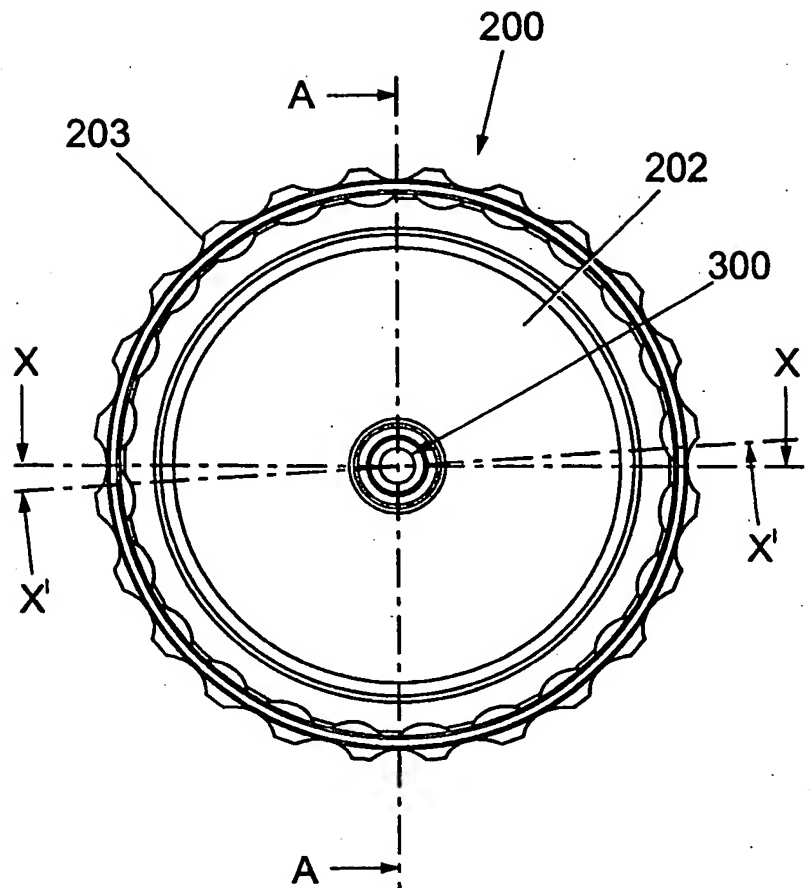


Fig. 24

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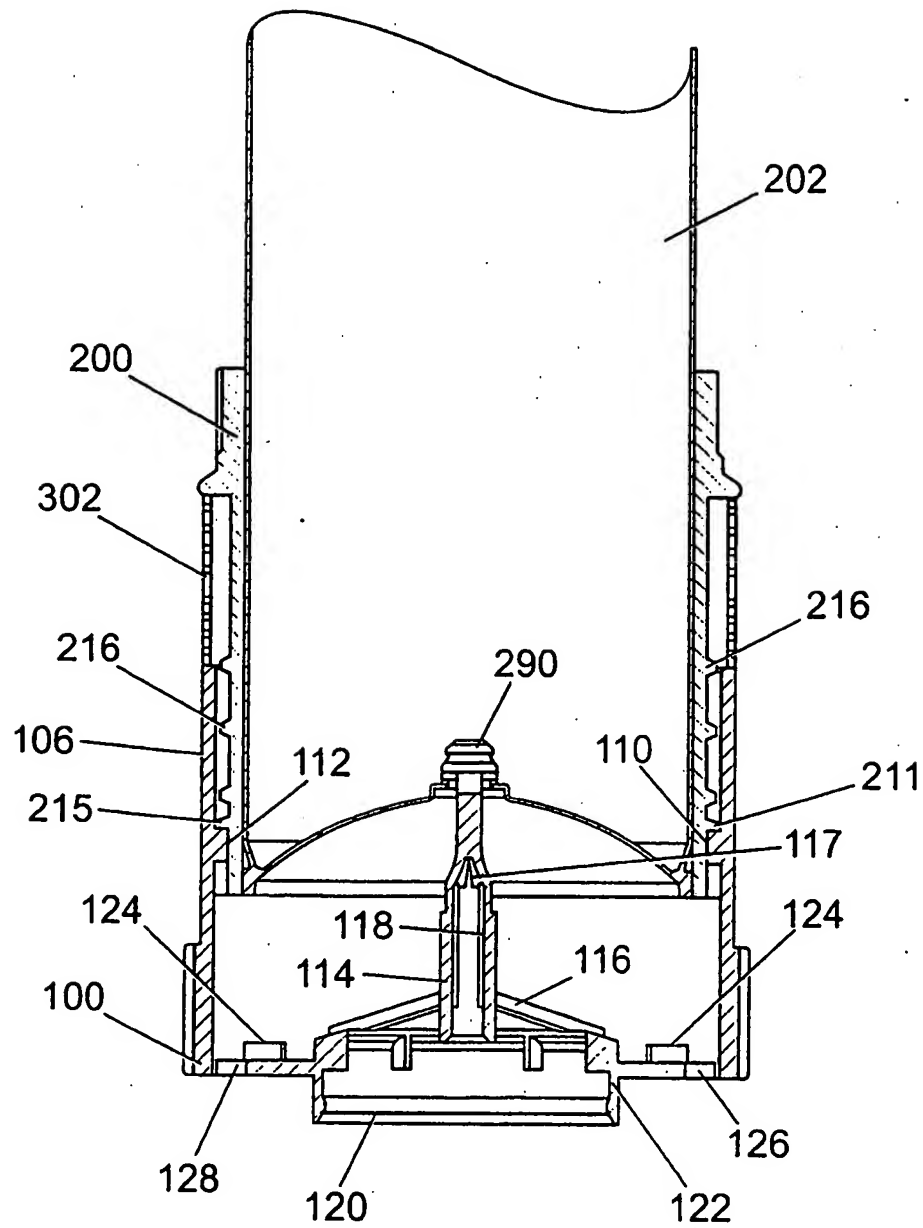


Fig. 25



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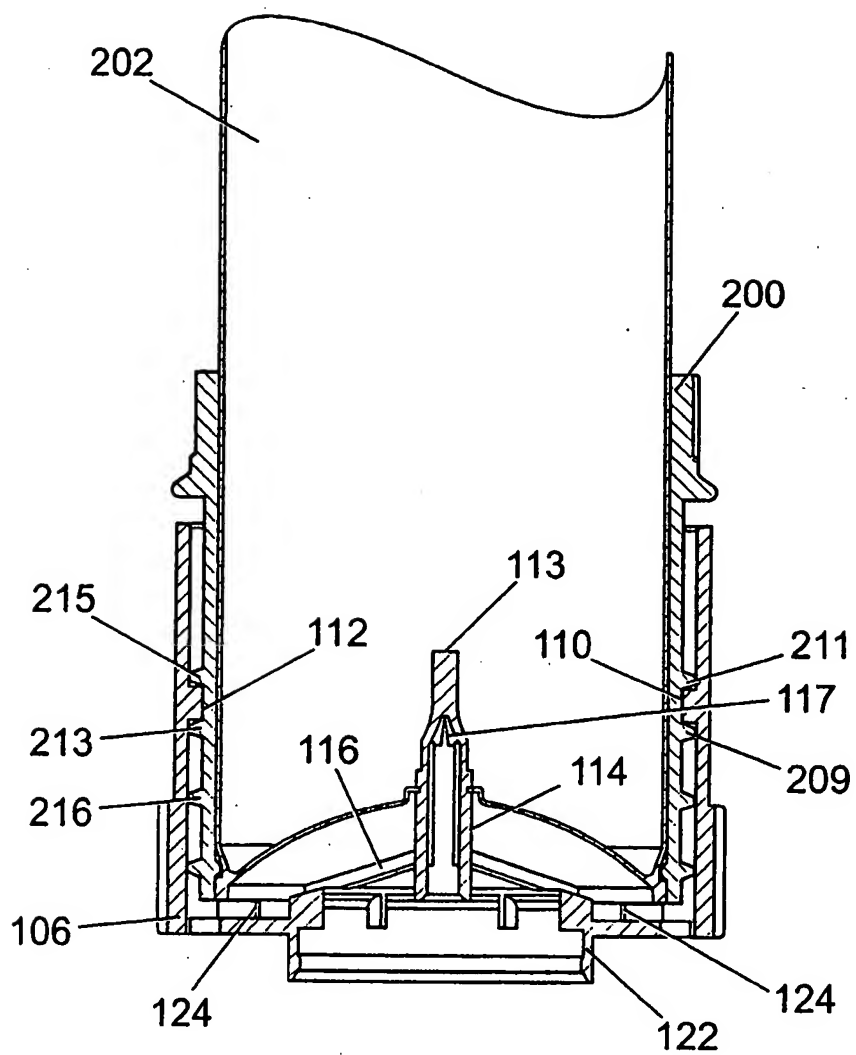


Fig. 27

**PCT/GB 99/03516**

IPC 7      B65D81/32      B65D83/14

**B. FIELDS SEARCHED**

IPC 7 865D

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 217 582 A (UNILEVER PLC ; UNILEVER NV (NL)) 8 Apr 11 1987 (1987-04-08)	1-4, 6-8, 12, 13, 18, 21, 24, 25, 27
A	claims; figures —	19, 20, 22
X	GB 1 059 265 A (LABORATOIRES CHIBRIT) 15 February 1967 (1967-02-15)	1-3, 7, 18, 21, 24, 25, 27
	claims; figures —	
X	DE 87 04 600 U (COCON KUNSTOFFEN) 15 October 1987 (1987-10-15)	1-3, 7, 18, 21, 24, 27
A	claims; figures —	8, 19
	— -/-	

**X** Patent family members are listed in annex.

**"a" document member of the same patent family**

**28/02/2000**

**SERRANO GALARRAGA, J**

# INTERNATIONAL SEARCH REPORT

Intern. Application No.

PCT/GB 99/03516

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>GB 2 142 385 A (BROOKS WILLIAM R) 16 January 1985 (1985-01-16)</p> <p>claims; figures _____</p>	<p>1,3,4,6, 12,13, 18,19, 21,22, 24,27</p>

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